FIELD REVIEW COMMENTS

Consolidated Field Comments for TSO-C199					
#	**Name**	**Paragraph Section**	**Comment**	**Suggested resolution**	**AIR-130 Disposition**
6	Gary Furr	Many	The TSO should ref DO-260B to include the Corrigendum	Ref corrigendum in document	Text changed
7	AIR-130	1.1	change standards to requirements		Text changed
8	AFS-830	8. d page 6	14 Parts are free downloads on faa.gov	Add faa.gov and regulations to 8.c and / or 8.d	link updated
9	AIR-130	Subject	change title, delete "for aircraft without electrical systems or excepted by 14 CFR 91.215 and 91.225	remove text	concur, text removed
10	AIR-130	Purpose	change text. On the third line, replace standards (MPS) with requirements		concur, change made
11	AIR-130	2.5.2.2	Add (SDA) after System Design Assurance		concur
12	ANM-130L	4. Marking	There was no requirement to identify deviations in the marking section. Recommend adding language for marking Deviation.	Add section e. that states something to the effect "Identify deviations granted to the article by marking "Deviation. See installation/instruction manual (IM)" after the TSO number."	Text based on TSO template, comment forwarded on to TSO template manager
13	ANM-100D	P. 6 ¶ 8. c,	Wrong URL used. 1. The website changed and the instructions are no longer valid. 2. The www.access.gpo.gov portal is difficult to	1. Replace "You can also order copies online …" with "You can also order copies online from www.bookstore.gpo.gov."	Link updated

			navigate & is not the most direct access to the Bookstore. 3. P. 6 ¶ 8. a. b. & d. do not provide navigation on the referenced web pages.	2. Delete the last two sentences (page navigation).	
14	ANM-160S	2.3.5.1, non-flight section of table 12, page 14	"Non flight (optional in flight) (i.e., laptop)" – Don't understand why a laptop is referenced here. Laptop use for installation & maintenance use on ground probably okay. Should NOT be allowed to use laptop as a means to enter 4096 or flight ID airborne.	Remove laptop reference.	Text changed to reference PED (i.e. iPad or similar). Accessing the TABS device via a PED was deemed acceptable on the ground. No intention to allow PED use in flight.
15	ANM-160S	2.3.5.1, page 13	Include guidance that expands on the required indicators should be clear & easy to understand to the pilot as well as any color use.	Add the following to this section: The required indicators should clearly indicate the current state of the system (i.e., on, failed, etc.) to the pilot. The color scheme as outlined in §23.1322 should be used as guidance if color is applied to any required indicators.	The MOPS requirements for Transponder and ADS-B Fail indications were not changed by TSO-C199. The existing standard applies as well as associated guidance material published for Part 23.
16	ANM-160S	2.3.5.3, table 14, page 14	Suggest display is required for both ground and flight.	Modified text for this TSO to read: A means of selecting and displaying the ATCRBS 4096 code on the ground and in flight shall be required.	Display of 4096 code was not made mandatory to reduce cost. Ability to display 4096 code in flight is encouraged.
17	ANM-160S	2.3.5.4, table 15,	Why is displaying on the ground required, but not in	Modified text for this TSO to read: A means of	Air/Ground state determination was not made mandatory to reduce cost. Ability to determine

		page 15	flight? If the system is unable to distinguish between ground and flight, how will the transponder do it? The transponder should be able to distinguish between ground and flight and so should the system.	selecting the air/ground state: An automatic means to determine the air/ground state is required.	air/ground state is encouraged.
18	ANM-160S	2.3.5.3, page 23	Include the requirement of air/ground display.	Testing should verify that a means of selecting and displaying the ATCRBS 4096 code on the ground and in the air is provided.	Display of 4096 code was not made mandatory to reduce cost. Ability to display 4096 code in flight is encouraged.
19	ANM-160S	2.3.5.4, page 23	Include the requirement of air/ground display.	An automatic means to determine the air/ground state is provided and shown that it functions properly.	Air/Ground state determination was not made mandatory to reduce cost. Ability to determine air/ground state is encouraged.
20	ASW-150	3.b	I don't agree that "hazardously" misleading information is a minor failure	remove the word hazardously	HMI is the correct terminology to use in this section. The minor failure is a judgment on the acceptable rate of HMI for this use case (i.e. air to air situation awareness), see AC 25-1309.
21	ASW-150	6h	Asks for items 6a through 6h	change 6h to 6g.	Text changed
22	ACE-111	2.3 Transponder function	The requirements are based off of a Mode S TSO-112C transponder. For the airspace that these will be used why not Mode C TSO-C74?	Can this be made to interface with a Mode C transponder?	LASE references TSO-112e. LASE system designed to interoperate to TAS and TCAS systems. LASE also provides limited ADS-B information. Limited ATCRBS functionality saves battery power and weight
23	ACE-111	2.5 ADS-B Out	Why 1090ES only? Again the majority of targets will be UAT.	Can we have a UAT out?	LASE is designed to interoperate with TAS and TCAS that only work on 1090 MHz
24	ACE-111	3.a Functionalit	A list is given that the LPSE is expected to be	Should this be able to work with TSAA?	LASE will interoperate with TSAA. TSAA is an application to be documented in TSO-C195b when

		y	seen by – TAS, TCAS I, TCAS II, ADS-B. Will it work with the proposed TSAA?		published.
25	ACE-114	3.b	This paragraph is ambiguous due to the use of the phrase "…is a minor failure condition for malfunctions causing hazardously misleading information…" Meaning, the term "hazardous" is usually only used in conjunction with "Major" or higher criticality failure conditions, so it is confusing to state or imply that "…malfunctions causing hazardously misleading information…" would only be classified as "minor" in nature.	I suggest either of two resolutions; the first being to reorder the sentences and rewrite this paragraph to read as follows (changes are in bold text): "Loss of the function defined in paragraph 3.a of this TSO is a minor failure condition. Failure of the function defined in paragraph 3.a of this TSO is a**t least a major** ~~**minor**~~ failure condition for **any** malfunctions causing hazardously misleading information. Design the system to at least these failure condition classifications." or else, simply remove the term "hazardously" from the original wording (if it is not truly a hazardous failure condition) to remove the ambiguity.	HMI is the correct terminology to use in this section. The minor failure is a judgment on the acceptable rate of HMI for this use case (i.e. air to air situation awareness), see AC 25-1309.
26	ACE-111	Paragraph 3.d Environmen	TSO-C142a which is for Non-Rechargeable Lithium Cells and Batteries is	Delete the reference to TSO-C142a. It is covered in other	1 - Battery power is addressed by other rules and regulations. The LASE TSO is silent on this issue since battery requirements are in review. Manufactures

		tal Qualificatio n	listed. This TSO does not cover the use of Li batteries or uses this TSO as a reference in the document.	requirements outside of the LPSE	will need to follow battery requirements at time of production 2 - Aircraft with electrical systems operating in rule airspace will need to follow 91.215 and 91.225. LASE may be designed to operate off of aircraft power for installations operated outside of rule airspace
27	ACE-114	3.d, Note	This Note refers to DO-160D, however DO-160 up to this point had not yet been mentioned in this TSO.	If DO-160 was intended to be introduced/referenced in paragraph 3.d, then do so prior to its use in the Note.	Environmental test in DO-260B point to DO-160(). This note allows the use of previous versions, in this case 160D change 2 and higher
28	ACE-114	3.e, Note	This Note implies the satisfaction of objectives based only on a "…FAA review of the applicable life cycle data…" but gives no consideration to that data's acceptability or quality (or lack of).	I suggest either of two resolutions; the first being to change the Note to read as follows (changes are in bold text): "…will be considered satisfied after FAA review **and acceptance** of the applicable life cycle data…" or else, simply delete the Note altogether to avoid giving the impression of a blanket approval based solely upon a review.	Text based on TSO template, comment forwarded on to TSO template manager
29	ACE-114	3.f, Note	This Note implies the satisfaction of objectives based only on a "…FAA review of the applicable life cycle data…" but gives no consideration to the	I suggest either of two resolutions; the first being to change the Note to read as follows (changes are in bold text):	Text based on TSO template, comment forwarded on to TSO template manager

			acceptability or quality of (or lack of) that data.	"…will be considered satisfied after FAA review **and acceptance** of the applicable life cycle data…" or else, simply delete the Note altogether to avoid giving the impression of a blanket approval based solely upon a review.	
30	ACE-114	5	Question: Why is paragraph 5.g excluded from the required data submittal?		Text based on TSO template, comment forwarded on to TSO template manager
31	ACE-114	6.h	It would appear that there is a missing item in this list; there should be an item that is similar to that of 6.g (which refers to software), but that refers instead to DO-254 for airborne electronic hardware.	Insert a new 6.h in place of the existing 6.h (making the original 6.h become 6.i) to read as follows: "6.h. If the article includes complex custom airborne electronic hardware, the appropriate documentation defined in RTCA/DO-254 including all data supporting the applicable objectives in RTCA/DO-254 *Appendix A, Modulation of Hardware Life Cycle Data Based on Hardware Design Assurance Level*."	Text based on TSO template, comment forwarded on to TSO template manager

32	ACE-114	6.h	This item refers to itself in the phrase "…6.a through 6.h…" which I don't believe is correct.	I believe this problem would be resolved if the previous comment's Suggested Resolution were incorporated via the addition of a new item 6.h. In that case, the content would not need to be changed, only the paragraph number would need to be changed to "6.i."	Text changed 6.h now points to 6a – 6g
33	ACE-114	6h	Reference is made to non-TSO functions in paragraphs 6.a through 6.h. Paragraph 6.h does not contain any function description.	Reword paragraph 6.h to read: "If the article contains non-TSO function(s), you must also make available items 6.a through 6.g as they pertain to non-TSO function(s)."	Text changed 6.h now points to 6a – 6g
34	ACE-114	8.b	The EUROCAE ED-### documents that are counterparts to the RTCA DO-### documents were mentioned only for ED-73C/D and DO-181D/E, respectively. However, several other RTCA DOs were referenced in this TSO but without any mention of their corresponding ED's, i.e., DO-160D/G, DO-178B, DO-254, DO-260B, and DO-282B.	If the corresponding EUROCAE ED-### document numbers were intended to be referenced, along with their counterpart RTCA DO-### documents, then add them to this TSO.	For the software/hardware design assurance docs and the environmental qual docs, these paragraphs are TSO boilerplate. Contact Doug Law. There is no Eurocae spec that corresponds to DO-282B. Reference to ED-73 is in a paragraph changed by this TSO.
35	ACE-114	Appendix 1, 2.2.1.1	Although I understand the intent, this paragraph is not logical, nor as clear as it	For clarity, suggest changing the paragraph to read as follows	Class definition clarified

			could be. Meaning, in its defining of Class B and Class C, one could interpret it to imply that each class only contains the functionality of the next lower Class; e.g., it says "…a Class B LPSE will contain the functionality of a Class A LPSE…" and "…a Class C LPSE will contain the functions of a Class B and Class A LPSE…" but in neither case does it say anything about the additional Class B or C functionalities that make them into these new classes.	(changes are in bold text): "LPSE **classes** are designed to build on the previous class. For example**, a Class A LPSE has the least functionality, a Class B LPSE adds functionality to that of Class A, and a Class C LPSE adds yet even more functionality to that of Class B."**	
36	ACE-114	Appendix 2, 2.5.2.3	This paragraph ends with "…set to 1 per." I am not sure if this is as intended, or if it is actually missing additional text.	Recheck this paragraph to determine if it should remain the same or end with "…set to 1." (deleting the "per") or end with "…set to 1 per **the appropriate additional text**."	Text changed
37	ACE-114	Subject section	The format of the first CFR reference is not in the same standard format as the rest of the document; i.e., the "14" does not precede the "CFR".	Change from "CFR 14 91.215" to "14 CFR 91.215"	Text changed
38	ACE-114	Several paragraphs throughout the TSO	The format of the CFR references are not in the same standard format throughout the document;	Use the same CFR reference format throughout, whether it includes the section	Text changed

		main body	i.e., initial references do not include the "§" (section/part) symbol, yet later ones do.	symbol, or not, e.g., "14 CFR § 91.215"	
39	ACE-114	Appendix 1, 2.1.1, Table 1	The word "underlining" was misspelled.	Change "underling" to "underlining"	Text changed
40	ACE-114	Appendix 1, 2.7.2.1	There is no "." (period) at the end of the paragraph.	Add a "." to the end of the paragraph.	Text changed
41	ACE-114	Appendix 1, 2.7.3.1	There is no "." (period) at the end of the paragraph.	Add a "." to the end of the paragraph.	Text removed
42	ACE-114	Appendix 2, 2.1.1, Table 1	The word "underlining" was misspelled.	Change "underling" to "underlining"	Text changed
43	ACE-114	Appendix 2, 2.3.2.2	There is no "." (period) at the end of the paragraph.	Add a "." to the end of the paragraph.	Text changed
44	ACE-114	Appendix 2, 2.3.2.4.2	There is an extra "." (period) at the end of the paragraph.	Delete the extra "." from the end of the paragraph.	Text changed
45	ACE-114	Appendix 2, 2.3.3.3	There is no "." (period) at the end of the paragraph.	Add a "." to the end of the paragraph.	Text changed
46	ACE-114	Appendix 2, 2.4.1	There is an extra " 06" at the end of the paragraph.	Delete the extra " 06" from the end of the paragraph.	Text changed
47	ACE-114	Appendix 2, 2.5.2.1.3	There is no "." (period) at the end of the paragraph.	Add a "." to the end of the paragraph.	Text changed
48	ACE-114	Appendix 2, 2.7.2.1	There is no "." (period) at the end of the paragraph.	Add a "." to the end of the paragraph.	Text changed
49	ACE-114	Appendix 2, 2.7.3.1	There is no "." (period) at the end of the paragraph.	Add a "." to the end of the paragraph.	Text changed
50	ANE-150	page 2 para 3.b	Does para 3.b need to request a Functional Hazard Assessment (FHA) be filed as part of the TSO application paperwork?	The FHA would be used to feed software and complex hardware requirements. It would also help reviewers determine the critical areas of the systems and software	See page 38 of DO-319. Safety assessment done by the ADS-B Application committee documented the required criticality for the air-to-air display of traffic information to support the see-and-avoid responsibility. This is the level of criticality required by TSO-C199. See Annex C for the detailed safety assessment including Operational Hazard Assessment.

51	AIR-130	3.a.(1)	Last sentence makes it sound as though only aircraft equipped with the latest standards will see aircraft an LPSE (e.g. see comment for TCAS II systems)	this should state that is works with all TSO variations	Text changed
52	AIR-130	3.a.(1)	What about aircraft equipped with TSO-C119 and TSO-C119a equipment etc.?	this should state that is works with all TSO variations	Text changed
53	AIR-130	App 1 para 1.1	same comment as my previous comments	this should state that is works with all TSO variations	Text changed
54	AIR-130	App 1 para 2.3.2.1	Mode C is not an All-Call interrogation.	Should this read the Transponder ATCRBS and All-Call type interrogations	Text changed
55	AIR-130	App 1 para 2.3.5.2	What's the difference from what's called out in DO-181E? Would be better said shall be provided as modified in 2.3.5.3 through 2.3.5.6?	What's the difference from what's called out in DO-181E? Would be better said shall be provided as modified in 2.3.5.3 through 2.3.5.6?	Text changed
56	AIR-130	App 1 Para 2.5.2.1.1	Consider requiring Airborne Position and Airborne velocity to remain at their nominal rates in order to avoid dropping of tracks by ground stations or by TCAS.	Consider requiring Airborne Position and Airborne velocity to remain at their nominal rates in order to avoid dropping of tracks by ground stations or by TCAS.	Text changed
57	AIR-130	App 1 para 2.5.2.1.3	EUROCAE should be harmonized with the US calling out ED-73E	change D to E	Text changed
58	AIR-130	App 2 para 2.3.2.1	should it read Except where noted here. There is no paragraph m in section 2.2.18.2.2		Text changed

59	AIR-130	App 2 para 2.3.2.4.2	There is no paragraph m in section 2.2.18.2.2		This paragraph was added
60	AIR-130	App 2 para 2.3.2.4.2	Don't understand the shall statement sounds unclear.		Text changed
61	ANE-150	Page 3 paragraph 4. e.	How about a list of Non TSO functions or require that they be identified in the SCI as Non-TSO functions? What about a list of open problem reports from both Software and Complex hardware development (DO-178b and DO-254)?	Non-TSO functions and Open problem reports should both be reviewed by the installer at installation time. Often, these items are not provided by the TSO holder as there does not seem to be a requirement to do so yet. Let the TSO provide the requirement to provide this data. See the TSOs own paragraph 4.f.2. below on the same page. This may be a plain language issue.	No para 4e. Possible reference to 5f6. If so, text based on TSO template, comment forwarded on to TSO template manager
62	ANE-150	Page 3, para. 4.f.6	What about deactivated code which may be embedded in the application? How about test plans to verify that the code is not active after installation.	Sometimes deactivate code is set to become active based on a pin setting. What if	No 4f6. Possible reference to 5f6, if so text based on TSO template, comment forwarded on to TSO template manager
63	ANE-150	Page 3 para f.	If the system has external network or data storage connections, like a USB key port, what about a description of the computer security concerns and approaches?	The low power surveillance equipment provides navigation input data to not only the vehicle its installed on but also to other vehicles in the airspace. Is computer security a concern, if not, please say so and explain why not.	Collision avoidance systems use range and bearing information of the signal not actual message. LASE equipment will not support ATC separation services.
64	ANE-150	Page 5 para 6.i	How about a list of open problem reports?	Open problem reports for both complex hardware and software should be reviewed by the installer.	Text based on TSO template, comment forwarded on to TSO template manager
65	ANE-150	Page 7, paragraph 1.1	Do drones and UAVs fit under this TSO? If so, should they be mentioned or specifically referred to a different applicable document?	As a reader, I am not sure whether or not drones and UAV might use this TSO.	Policy for UAS mandatory equipage is not published, but is expected to conform to the existing Part 91 rules as much as possible. Therefore, UAS are expected to fully comply with 91.215, 91.225, and 91.227.
66	ANE-150	Page 21, para 2.3.2.1	Spelling mistake: "Accept where noted here," should be "Except where noted here,"	Spelling mistake	Text changed

67	ANE-150	Page 1 paragraph 3	No MPS for continuous-use battery duration.	"Designs specifically intended for long term battery operation are ideal" is not a MPS.	This is not a requirement, just a good idea
68	ANE-150	Page 1 paragraph 3	No reference to TSO-C179a.	"Self contained replaceable batteries, rechargeable batteries or batteries that can be recharged in flight can be used" does not address rechargeable lithium battery systems.	References to battery TSO's are not provide since they are being rewritten at this time.
69	ANE-150	Page 2 paragraph 3.d.	Summarize what sections of RTCA/DO-160F need to be complied with.	Current wording too lengthy/complicated.	Text reworded
70	ANE-150	Page 2 paragraph 3.e.	RTCA/DO-178C is current standard.	RTCA/DO-178B superseded by 178C.	TSO template language used, DO-178B or higher may be acceptable.
71	ANE-150	Page 7, paragraph 2.2.1	The fourth sentence is confusing. Suggest rewriting to make it clearer.	TSOs should be clear and concise.	Rewrite sentence.	Text reworded and moved
72	ANE-150	Page 13, paragraph 2.3.5.1	Number agreement in first sentence	TSOs should be written with good grammar	Rewrite sentence.	Text changed
73	ANE-150	Page 13, paragraph 2.3.5.1	Last sentence is a run-on sentence.	TSOs should be written with good grammar	Rewrite (split) sentence.	Text changed
74	ANE-150	Page 14, table 12	Shouldn't the battery life be an optional indicator?	The battery life indicator is recommended in the text but is not listed in table.	Add battery life indicator as an optional indicator in Table 12.	Test changed
75	ANE-150	Page 14, paragraph 2.3.5.2	Not clear what the change is from DO-181E, section 2.1.7, which only lists items a – f.	Not clear what the change the TSO is making from the DO-181E requirements.	Indicate that the functions are either modified or are not required as indicated in the following sections.	Table format changed
76	ANE-150	Page 15, paragraph 2.3.5.6	Remove the "but not required."	It is understood that requirements that are recommended are not required. Language not concise.	Text changed

77	ANE-150	Page 25, paragraph 2.8	What about test antenna requirements for the other functions?	Transponder is not the only function that could be included (e.g. position source)	Para A1.2.7.1 indicates the antennas SHOULD comply with the existing antenna TSOs for Transponders and GPS. Para A1.2.7.3 only refers to Transponder antennas because the GPS antenna does not transmit.
78	AFS-830	8d page 6	14 Parts are free downloads on FAA.gov	Add FAA.gov and regulations to 8c and or 8d	Text with 14 CFR link updated